

What is claimed is:

1. A method of determining the concentration of an analyte in a multiplicity of samples of different origins using an instrument which separates and classifies microparticles and measures the results of a bimolecular reaction between an analyte and a reagent, comprising the steps of:

(a) providing a population of microparticles which includes distinct subpopulations of microparticles, each distinct subpopulation of which is uniquely labeled with two labels having two characteristics detectable by the instrument, substantially all microparticles of the population having attached to each microparticle a reagent which reacts with the analyte in a bimolecular reaction, the results of the bimolecular reaction measurable by the instrument;

(b) exposing each sample to one subpopulation of microparticles;

(c) adding additional reagents to the mixture to facilitate a bimolecular reaction;

(d) incubating the mixture until the bimolecular reaction is substantially complete;

(e) combining the reacted samples;

(f) passing the combined samples through the instrument;

(g) identifying the subpopulation of each microparticle using the two characteristics of each respective subpopulation;

(h) measuring the result of the reagent and analyte bimolecular reaction on each microparticle; and

(i) calculating the concentration of analyte in each sample.

2. A method of determining the concentration of a multiplicity of analytes in a sample of a single origin using an instrument which separates and classifies microparticles and measures the results of a bimolecular reaction between an analyte and a reagent, comprising the steps of:

(a) providing a population of microparticles which includes subpopulations of microparticles, each subpopulation of which is uniquely labeled with two labels having two characteristics detectable by the instrument, substantially all of the microparticles of each subpopulation having attached a reagent which reacts with one of the analytes with a bimolecular reaction, the results of the bimolecular reaction between reagent and analyte being measured in the instrument;

(b) mixing an aliquot of the sample with each subpopulation of microparticles;

(c) adding additional reagents to the mixture to facilitate a bimolecular reaction between an analyte and a reagent;

(d) incubating the mixture until the bimolecular reactions are substantially complete;

(e) combining the reacted samples;

(f) passing the combined samples through the instrument;

- (g) identifying the subpopulation of each microparticle using the characteristics of the subpopulation;
- (h) determining the results of the reaction between reagent and analyte on each microparticle by measuring the result of the reagent and analyte bimolecular reaction; and
- (i) calculating the concentration of analyte in each sample.